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This paper is the first of a series of three articles relating to a case study conducted at Fairfield University to assess aspects of the rapid introduction of Information Technology at the institution. This article deals with the nature of the problem faced by Fairfield University, the characteristics of the case methodology, and lays the foundation for the selection of this research technique for the current study. The paper begins with an Introduction section to familiarize the reader with the case organization. The following section on Case Methodology explores the history, and some of the applications of the technique. The section ends with specific research protocols for researchers.

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Introduction to Case Study

by

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Abstract

This paper is the first of a series of three articles relating to a case study conducted at Fairfield University to assess aspects of the rapid introduction of Information Technology at the institution. This article deals with the nature of the problem faced by Fairfield University, the characteristics of the case methodology, and lays the foundation for the selection of this research technique for the current study. The paper begins with an Introduction section to familiarize the reader with the case organization. The following section on Case Methodology explores the history, and some of the applications of the technique. The section ends with specific research protocols for researchers.

Introduction

Fairfield University is a private liberal arts institution of about 3,000 full time undergraduate students and about 1,000 graduate school students. The undergraduate students are distributed through the College of Arts and Sciences, the School of Business, and the School of Nursing. The graduate students are in the Graduate School of Education, the School of Business, and the School of Nursing. There are also part time students in the School of Continuing Education and the BEI School of Engineering. As with many other private institutions of higher education, Fairfield University faces many challenges.

These challenges come from the declining population of college age students and the growing cost of running the institution. The literature will support the preceding statement ([Crossland](#), 1980), but provide little comfort to the institution. One of the areas of greatest concern to college managers is the continuing cost of information technology. With the constant need to increase staff salaries, it is like salaries, inadvisable to reduce the outlay on information technology. Interviews that were conducted by this researcher with the deans and managers indicated that some of the peer institutions of Fairfield University are in fact doing as much if not more in this area. Hence any interruption in the effort to maintain technological currency would result in a competitive disadvantage for the institution. Therein lies the administrative financial challenge. The expense on information technology must be maintained at a time of declining revenues ([Nicklin](#), 1992).

The field of information technology at a university is very broad and could encompass many technologies hitherto not considered within its purview. However, there has been a relentless and indeed accelerating pace of convergence of the technologies in telecommunications, library services, and video services. The current study is concerned only with the aspects of information

technology as it relates to academic computing and will focus on instructional and research computing.

The goals of this study include an examination of the (a) managerial and (b) economic aspects of the rapid acquisition of information technology. The objectives deriving from those goals are:

1. An assessment of the categories of computer use in higher education.
2. An evaluation of the managerial issues of computing, including the centralization/decentralization of computing, client/server computing and the aspects of the Internet and the World Wide Web (WWW)
3. Establish a basis for understanding the current and future economic aspects of information technology acquisition.

The research questions arising from the above objectives were as follows:

Objective 1 above is addressed by the question: "What patterns of acquisition emerge from the current computing environment and the perceived needs for computing?"

Objective 2 is addressed by the question: "What characteristics of the categories of computing use contribute to the patterns of acquisition?" The five categories developed by [King and Kraemer](#) (1985) and adapted for use by [Levy](#) (1988) in his study at the University of Arizona, are used in this study, to examine the computing use at Fairfield University.

Objective 3 is addressed by the question: "What managerial issues arise from the rapid acquisition of information technology and how important have those technologies become to the organization?"

Objective 4 is addressed by the question: "How will the institution balance the need for technological changes with the need to continue the accomplishment of routine tasks?."

[Samuel Levy](#) (1988) conducted a study of instructional and research computing at the University of Arizona. This study replicates and extends the [Levy](#) (1988) study, and was conducted at Fairfield University. The current study extends the [Levy](#) (1988) study in its examination of aspects of the Internet, the World Wide Web, and Client/Server computing. [Levy](#) (1988) established the use of the case study as appropriate for the research project, and this researcher also used the literature to confirm the use of case methodology in the study at Fairfield University.

The history and development of case methodology is reviewed, in support of the current case study at Fairfield University. There have been periods of intense use followed by periods of disuse of this technique, as documented by [Hamel, Dufour, and Fortin](#) (1993) as well as others. The relevance of that history to this study is important in that it establishes the known advantages and disadvantages of the methodology. The particular technique of a single-case study is reviewed, since that is the specific implementation of a case study at Fairfield University and was also used by [Levy](#) (1988).

Case Study Methodology

The history of case study research is marked by periods of intense use and periods of disuse. The earliest use of this form of research can be traced to Europe, predominantly to France. The methodology in the United States was most closely associated with The University of Chicago Department of Sociology. From the early 1900's until 1935, The Chicago School was preeminent in the field and the source of a great deal of the literature.

There was a wealth of material in Chicago, since it was a period of immigration to the United States and various aspects of immigration of different national groups to the city were studied and reported on ([Hamel et al.](#), 1993). Issues of poverty, unemployment, and other conditions deriving from immigration were ideally suited to the case study methodology. [Zonabend](#) (1992) stated that case study is done by giving special attention to completeness in observation, reconstruction, and analysis of the cases under study. Case study is done in a way that incorporates the views of the "actors" in the case under study.

The field of sociology is associated most strongly with case study research, and during the period leading up to 1935, several problems were raised by researchers in other fields. This coincided with a movement within sociology, to make it more scientific. This meant providing some quantitative measurements to the research design and analysis. Since The Chicago School was most identified with this methodology, there were serious attacks on their primacy. This resulted in the denigration of case study as a methodology. In 1935, there was a public dispute between Columbia University professors, who were championing the scientific method, and The Chicago School and its supporters. The outcome was a victory for Columbia University and the consequent decline in the use of case study as a research methodology.

Hamel ([Hamel et al.](#), 1993) was careful to reject the criticisms of case study as poorly founded, made in the midst of methodological conflict. He asserted that the drawbacks of case study were not being attacked, rather the immaturity of sociology as a discipline was being displayed. As the use of quantitative methods advanced, the decline of the case study hastened. However, in the 1960s, researchers were becoming concerned about the limitations of quantitative methods. Hence there was a renewed interest in case study. [Strauss and Glaser](#) (1967) developed the concept of "grounded theory." This along with some well regarded studies accelerated the renewed use of the methodology.

A frequent criticism of case study methodology is that its dependence on a single case renders it incapable of providing a generalizing conclusion. [Yin](#) (1993) presented Giddens' view that considered case methodology "microscopic" because it "lacked a sufficient number" of cases. Hamel ([Hamel et al.](#), 1993) and Yin ([1984](#), [1989a](#), [1989b](#), [1993](#), [1994](#)) forcefully argued that the relative size of the sample whether 2, 10, or 100 cases are used, does not transform a multiple case into a macroscopic study. The goal of the study should establish the parameters, and then should be applied to all research. In this way, even a single case could be considered acceptable, provided it met the established objective.

The literature provides some insight into the acceptance of an experimental prototype to perceive the singularity of the object of study. This ensures the transformation from the local to the global for explanation. Hamel ([Hamel et al.](#), 1993) characterized such singularity as a concentration of the global in the local. [Yin](#) (1989a) stated that general applicability results from the set of

methodological qualities of the case, and the rigor with which the case is constructed. He detailed the procedures that would satisfy the required methodological rigor. Case study can be seen to satisfy the three tenets of the qualitative method: describing, understanding, and explaining.

The literature contains numerous examples of applications of the case study methodology. The earliest and most natural examples are to be found in the fields of Law and Medicine, where "cases" make up the large body of the student work. However, there are some areas that have used case study techniques extensively, particularly in government and in evaluative situations. The government studies were carried out to determine whether particular programs were efficient or if the goals of a particular program were being met. The evaluative applications were carried out to assess the effectiveness of educational initiatives. In both types of investigations, merely quantitative techniques tended to obscure some of the important information that the researchers needed to uncover.

The body of literature in case study research is "primitive and limited" (Yin, 1994), in comparison to that of experimental or quasi-experimental research. The requirements and inflexibility of the latter forms of research make case studies the only viable alternative in some instances. It is a fact that case studies do not need to have a minimum number of cases, or to randomly "select" cases. The researcher is called upon to work with the situation that presents itself in each case.

Case studies can be single or multiple-case designs, where a multiple design must follow a replication rather than sampling logic. When no other cases are available for replication, the researcher is limited to single-case designs. Yin (1994) pointed out that generalization of results, from either single or multiple designs, is made to theory and not to populations. Multiple cases strengthen the results by replicating the pattern-matching, thus increasing confidence in the robustness of the theory. Applications of case study methodology have been carried out in High-Risk Youth Programs (Yin, 1993) by several researchers.

The effects of community-based prevention programs have been widely investigated using case methodology. Where the high risk youth studies assumed a single case evaluation, these studies have typically used a collection of cases as a multiple-case study. This has been true in the various substance abuse prevention programs that are community-based (Holder, 1987; Sabol, 1990; Yin, 1993). Numerous such studies sponsored by the U. S. General Accounting Office are distributed in the literature between Evans (1976) and Gopelrud (1990). These studies have gone beyond the quantitative statistical results and explained the conditions through the perspective of the "actors." Thus case study evaluations can cover both process and outcomes, because they can include both quantitative and qualitative data.

There are several examples of the use of case methodology in the literature. Yin (1993) listed several examples along with the appropriate research design in each case. There were suggestions for a general approach to designing case studies, and also recommendations for *exploratory*, *explanatory*, and *descriptive* case studies. Each of those three approaches can be either single or multiple-case studies, where multiple-case studies are replicatory, not sampled cases. There were also specific examples in education, and management information systems.

Education has embraced the case method for instructional use. Some of the applications are reviewed in this paper.

In *exploratory* case studies, fieldwork, and data collection may be undertaken prior to definition of the research questions and hypotheses. This type of study has been considered as a prelude to some social research. However, the framework of the study must be created ahead of time. Pilot projects are very useful in determining the final protocols that will be used. Survey questions may be dropped or added based on the outcome of the pilot study. Selecting cases is a difficult process, but the literature provides guidance in this area ([Yin, 1989a](#)). [Stake \(1995\)](#) recommended that the selection offers the opportunity to maximize what can be learned, knowing that time is limited. Hence the cases that are selected should be easy and willing subjects. A good instrumental case does not have to defend its typicality.

Explanatory cases are suitable for doing causal studies. In very complex and multivariate cases, the analysis can make use of pattern-matching techniques. [Yin and Moore \(1988\)](#) conducted a study to examine the reason why some research findings get into practical use. They used a funded research project as the unit of analysis, where the topic was constant but the project varied. The utilization outcomes were explained by three rival theories: a knowledge-driven theory, a problem-solving theory, and a social-interaction theory.

Knowledge-driven theory means that ideas and discoveries from basic research eventually become commercial products. Problem-solving theory follows the same path, but originates not with a researcher, but with an external source identifying a problem. The social-interaction theory claims that researchers and users belong to overlapping professional networks and are in frequent communication.

Descriptive cases require that the investigator begin with a descriptive theory, or face the possibility that problems will occur during the project. [Pyecha \(1988\)](#) used this methodology to study special education, using a pattern-matching procedure. Several states were studied and the data about each state's activities were compared to another, with idealized theoretic patterns. Thus what is implied in this type of study is the formation of hypotheses of cause-effect relationships. Hence the descriptive theory must cover the depth and scope of the case under study. The selection of cases and the unit of analysis is developed in the same manner as the other types of case studies.

Case studies have been increasingly used in education. While law and medical schools have been using the technique for an extended period, the technique is being applied in a variety of instructional situations. Schools of business have been most aggressive in the implementation of case based learning, or "active learning" ([Boisjoly & DeMichiell, 1994](#)). Harvard University has been a leader in this area, and cases developed by the faculty have been published for use by other institutions. The School of Business at Fairfield University has revised the curriculum so that in place of the individual longitudinal courses in the areas of Management, Marketing, Operations, Finance, and Information Systems, students take one course. That course is designed around cases that encompass those disciplines, but are presented in an integrated manner. The students are therefore made aware of the interrelatedness of the various disciplines and begin to

think in terms of wider problems and solutions. Later courses add the international dimension to the overall picture.

Case studies have been used to develop critical thinking ([Alvarez, et al.](#), 1990). There are also interactive language courses ([Carney](#), 1995), courses designed to broaden the students' horizons ([Brearley](#), 1990), and even for technical courses ([Greenwald](#), 1991), and philosophical ones ([Garvin](#), 1991).

This investigation is a case study of the aspects of Information Technology that are related to client/server computing, the Internet, and the World Wide Web, at Fairfield University. Thus this paper examines issues that will expand the reader's knowledge of case study methodology as it relates to the design and execution of such a study.

[Yin](#) (1994) recommended the use of case-study protocol as part of a carefully designed research project that would include the following sections:

- Overview of the project (project objectives and case study issues)
- Field procedures (credentials and access to sites)
- Questions (specific questions that the investigator must keep in mind during data collection)
- Guide for the report (outline, format for the narrative) ([Yin](#), 1994, p. 64)

The quintessential characteristic of case studies is that they strive towards a holistic understanding of cultural systems of action ([Feagin, Orum, & Sjoberg](#), 1990). Cultural systems of action refer to sets of interrelated activities engaged in by the actors in a social situation. The case studies must always have boundaries ([Stake](#), 1995). Case study research is not sampling research, which is a fact asserted by all the major researchers in the field, including Yin, Stake, Feagin and others. However, selecting cases must be done so as to maximize what can be learned, in the period of time available for the study.

The unit of analysis is a critical factor in the case study. It is typically a system of action rather than an individual or group of individuals. Case studies tend to be selective, focusing on one or two issues that are fundamental to understanding the system being examined.

Case studies are multi-perspectival analyses. This means that the researcher considers not just the voice and perspective of the actors, but also of the relevant groups of actors and the interaction between them. This one aspect is a salient point in the characteristic that case studies possess. They give a voice to the powerless and voiceless. When sociological studies present many studies of the homeless and powerless, they do so from the viewpoint of the "elite" ([Feagin, Orum, & Sjoberg](#), 1991).

Case study is known as a triangulated research strategy. Snow and Anderson (cited in [Feagin, Orum, & Sjoberg](#), 1991) asserted that triangulation can occur with data, investigators, theories, and even methodologies. [Stake](#) (1995) stated that the protocols that are used to ensure accuracy and alternative explanations are called triangulation. The need for triangulation arises from the ethical need to confirm the validity of the processes. In case studies, this could be done by using

multiple sources of data ([Yin](#), 1984). The problem in case studies is to establish meaning rather than location.

Designing Case Studies

[Yin](#) (1994) identified five components of research design that are important for case studies:

- A study's questions
- Its propositions, if any
- Its unit(s) of analysis
- The logic linking the data to the propositions
- The criteria for interpreting the findings ([Yin](#), 1994, p. 20).

The study's questions are most likely to be "how" and "why" questions, and their definition is the first task of the researcher. The study's propositions sometimes derive from the "how" and "why" questions, and are helpful in focusing the study's goals. Not all studies need to have propositions. An exploratory study, rather than having propositions, would have a stated purpose or criteria on which the success will be judged. The unit of analysis defines what the case is. This could be groups, organizations or countries, but it is the primary unit of analysis. Linking the data to propositions and the criteria for interpreting the findings are the least developed aspects in case studies ([Yin](#), 1994).

[Campbell](#) (1975) described "pattern-matching" as a useful technique for linking data to the propositions. [Campbell](#) (1975) asserted that pattern-matching is a situation where several pieces of information from the same case may be related to some theoretical proposition. His study showed, through pattern-matching, that the observed drop in the level of traffic fatalities in Connecticut was not related to the lowering of the speed limit. His study also illustrated some of the difficulties in establishing the criteria for interpreting the findings.

Construct validity is especially problematic in case study research. It has been a source of criticism because of potential investigator subjectivity. [Yin](#) (1994) proposed three remedies to counteract this: using multiple sources of evidence, establishing a chain of evidence, and having a draft case study report reviewed by key informants. Internal validity is a concern only in causal (explanatory) cases. This is usually a problem of "inferences" in case studies, and can be dealt with using pattern-matching, which has been described above. External validity deals with knowing whether the results are generalizable beyond the immediate case. Some of the criticism against case studies in this area relate to single-case studies. However, that criticism is directed at the statistical and not the analytical generalization that is the basis of case studies. Reliability is achieved in many ways in a case study. One of the most important methods is the development of the case study protocol.

Case studies can be either single or multiple-case designs. Single cases are used to confirm or challenge a theory, or to represent a unique or extreme case ([Yin](#), 1994). Single-case studies are also ideal for revelatory cases where an observer may have access to a phenomenon that was previously inaccessible. Single-case designs require careful investigation to avoid misrepresentation and to maximize the investigator's access to the evidence. These studies can be

holistic or embedded, the latter occurring when the same case study involves more than one unit of analysis. Multiple-case studies follow a replication logic. This is not to be confused with sampling logic where a selection is made out of a population, for inclusion in the study. This type of sample selection is improper in a case study. Each individual case study consists of a "whole" study, in which facts are gathered from various sources and conclusions drawn on those facts.

[Yin](#) (1994) asserted that a case study investigator must be able to operate as a senior investigator during the course of data collection. There should be a period of training which begins with the examination of the definition of the problem and the development of the case study design. If there is only a single investigator, this might not be necessary. The training would cover aspects that the investigator needs to know, such as: the reason for the study, the type of evidence being sought, and what variations might be expected. This could take the form of discussion rather than formal lectures.

A case study protocol contains more than the survey instrument, it should also contain procedures and general rules that should be followed in using the instrument. It is to be created prior to the data collection phase. It is essential in a multiple-case study, and desirable in a single-case study. [Yin](#) (1994) presented the protocol as a major component in asserting the reliability of the case study research. A typical protocol should have the following sections:

- An overview of the case study project (objectives, issues, topics being investigated)
- Field procedures (credentials and access to sites, sources of information)
- Case study questions (specific questions that the investigator must keep in mind during data collection)
- A guide for case study report (outline, format for the narrative) ([Yin](#), 1994, p. 64).

The overview should communicate to the reader the general topic of inquiry and the purpose of the case study. The field procedures mostly involve data collection issues and must be properly designed. The investigator does not control the data collection environment ([Yin](#), 1994) as in other research strategies; hence the procedures become all the more important. During interviews, which by nature are open ended, the subject's schedule must dictate the activity ([Stake](#), 1995). Gaining access to the subject organization, having sufficient resources while in the field, clearly scheduling data collection activities, and providing for unanticipated events, must all be planned for.

Case study questions are posed to the investigator, and must serve to remind that person of the data to be collected and its possible sources. The guide for the case study report is often neglected, but case studies do not have the uniform outline, as do other research reports. It is essential to plan this report as the case develops, to avoid problems at the end.

[Stake](#) (1995), and [Yin](#) (1994) identified at least six sources of evidence in case studies. The following is not an ordered list, but reflects the research of both [Yin](#) (1994) and [Stake](#) (1995):

- Documents
- Archival records

- Interviews
- Direct observation
- Participant-observation
- Physical artifacts

Documents could be letters, memoranda, agendas, administrative documents, newspaper articles, or any document that is germane to the investigation. In the interest of triangulation of evidence, the documents serve to corroborate the evidence from other sources. Documents are also useful for making inferences about events. Documents can lead to false leads, in the hands of inexperienced researchers, which has been a criticism of case study research. Documents are communications between parties in the study, the researcher being a vicarious observer; keeping this in mind will help the investigator avoid being misled by such documents.

Archival documents can be service records, organizational records, lists of names, survey data, and other such records. The investigator has to be careful in evaluating the accuracy of the records before using them. Even if the records are quantitative, they might still not be accurate.

Interviews are one of the most important sources of case study information. There are several forms of interviews that are possible: Open-ended, Focused, and Structured or survey. In an open-ended interview, key respondents are asked to comment about certain events. They may propose solutions or provide insight into events. They may also corroborate evidence obtained from other sources. The researcher must avoid becoming dependent on a single informant, and seek the same data from other sources to verify its authenticity.

The focused interview is used in a situation where the respondent is interviewed for a short period of time, usually answering set questions. This technique is often used to confirm data collected from another source.

The structured interview is similar to a survey, and is used to gather data in cases such as neighborhood studies. The questions are detailed and developed in advance, much as they are in a survey.

Direct observation occurs when a field visit is conducted during the case study. It could be as simple as casual data collection activities, or formal protocols to measure and record behaviors. This technique is useful for providing additional information about the topic being studied. The reliability is enhanced when more than one observer is involved in the task. [Glesne and Peshkin \(1992\)](#) recommended that researchers should be as unobtrusive as the wallpaper.

Participant-observation makes the researcher into an active participant in the events being studied. This often occurs in studies of neighborhoods or groups. The technique provides some unusual opportunities for collecting data, but could face some major problems as well. The researcher could well alter the course of events as part of the group, which may not be helpful to the study.

Physical artifacts can be tools, instruments, or some other physical evidence that may be collected during the study as part of a field visit. The perspective of the researcher can be broadened as a result of the discovery.

It is important to keep in mind that not all sources are relevant for all case studies ([Yin](#), 1994). The investigator should be capable of dealing with all of them, should it be necessary, but each case will present different opportunities for data collection.

There are some conditions that arise when a case researcher must start data collection before the study questions have been defined and finalized ([Yin](#), 1994). This is likely to be successful only with an experienced investigator. Another important point to review is the benefit of using rival hypotheses and theories as a means of adding quality control to the case study. This improves the perception of the fairness and serious thinking of the researcher.

Analyzing Case Study Evidence

This aspect of the case study methodology is the least developed and hence the most difficult. As a result, some researchers have suggested that if the study were made conducive to statistical analysis, the process would be easier and more acceptable. This quantitative approach would be appealing to some of the critics of the case study methodology. However not all case studies lend themselves to this type of analysis. [Miles and Huberman](#) (1984) suggested analytic techniques such as rearranging the arrays, placing the evidence in a matrix of categories, creating flowcharts or data displays, tabulating the frequency of different events, using means, variances and cross tabulations to examine the relationships between variables, and other such techniques to facilitate analysis.

There must first be an analytic strategy, that will lead to conclusions. [Yin](#) (1994) presented two strategies for general use: One is to rely on theoretical propositions of the study, and then to analyze the evidence based on those propositions. The other technique is to develop a case description, which would be a framework for organizing the case study. Lynd conducted a widely cited "Middletown" study in 1929, and used a formal chapter construct to guide the development of the analysis. In other situations, the original objective of the case study may help to identify some causal links that could be analyzed.

Pattern-matching is another major mode of analysis. This type of logic compares an empirical pattern with a predicted one. Internal validity is enhanced when the patterns coincide. If the case study is an explanatory one, the patterns may be related to the dependent or independent variables. If it is a descriptive study, the predicted pattern must be defined prior to data collection. [Yin](#) (1994) recommended using rival explanations as pattern-matching when there are independent variables involved. This requires the development of rival theoretical propositions, but the overall concern remains the degree to which a pattern matches the predicted one.

[Yin](#) (1994) encouraged researchers to make every effort to produce an analysis of the highest quality. In order to accomplish this, he presented four principles that should attract the researcher's attention:

- Show that the analysis relied on all the relevant evidence
- Include all major rival interpretations in the analysis
- Address the most significant aspect of the case study
- Use the researcher's prior, expert knowledge to further the analysis

[Stake](#) (1995) recommended categorical aggregation as another means of analysis and also suggested developing protocols for this phase of the case study to enhance the quality of the research. He also presented ideas on pattern-matching along the lines that [Yin](#) (1994) presented. [Runkel](#) (1990) used aggregated measures to obtain relative frequencies in a multiple-case study. [Stake](#) (1995) favored coding the data and identifying the issues more clearly at the analysis stage. [Eisner and Peshkin](#) (1990) placed a high priority on direct interpretation of events, and lower on interpretation of measurement data, which is another viable alternative to be considered.

There have been some valuable sources of information and guidance for case study methodologies. Hamel ([Hamel et al.](#), 1993), [Stake](#) (1995), and Yin ([1984](#), [1989a](#), [1994](#)) in particular have provided specific guidelines for the development of the design and execution of a case study. This researcher examines the proposed methodology for the development of survey instruments. This aspect is an important element of the data gathering function in the study.

Case study is a valuable method of research, with distinctive characteristics that make it ideal for many types of investigations. It can also be used in combination with other methods. Its use and reliability should make it a more widely used methodology, once its features are better understood by potential researchers.

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